

Assessment Schedule**Science: Describe aspects of chemistry (90189)****Evidence Statement**

| Question | Achievement | Achievement with Merit | Achievement with Excellence |
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| ONE (a) | <p>ONE Correct Statement. (a)</p> <p>^{12}C: 6 protons, 6 neutrons</p> <p>OR</p> <p>^{13}C: 6 protons, 7 neutrons</p> <p>OR</p> <p>Electron configuration of 2.4 for both ^{12}C AND ^{13}C</p> <p>OR</p> <p>An atom is neutral when it has equal numbers of protons and electrons.</p> <p>OR</p> <p>Relevant labelled diagram.</p> | <p>Atomic structure and electron configuration given for BOTH ^{12}C and ^{13}C PLUS an explanation why they are neutral. (m)</p> <p>^{12}C: 6 protons, 6 neutrons, electron configuration of 2.4</p> <p>^{13}C: 6 protons, 7 neutrons, electron configuration of 2.4</p> <p>AND</p> <p>^{12}C and ^{13}C are neutral as they both contain equal numbers of protons and electrons.</p> | |
| (b) | <p>ONE correct statement. (a)</p> <p>Mass is found by adding up protons and neutrons.</p> <p>OR</p> <p>Electrons have negligible mass (and are not included in mass calculation).</p> <p>OR</p> <p>Protons and neutrons make up (nearly) all the mass.</p> | <p>Explains how particles contribute to the overall mass. (m)</p> <p>Explains that the overall mass of an atom is made up of protons and neutrons, as the mass of the electrons is negligible.</p> | |
| (c) | <p>ONE correct statement. (a)</p> <p>^{13}N: 7 protons, 6 neutrons (or diagram).</p> <p>OR</p> <p>The mass of ^{13}N and ^{13}C are (nearly) the same.</p> <p>OR</p> <p>12 and 13 refer to total mass of element(s).</p> <p>OR</p> <p>Mass of ^{13}N is greater than ^{12}C.</p> | <p>ONE correct explanation. (m)</p> <p>^{13}N will have the same atomic mass as ^{13}C because the total number of protons and neutrons is the same.</p> <p>OR</p> <p>^{13}N is heavier than ^{12}C because it has one extra proton / extra particle.</p> | <p>Discusses how the mass of N-13 compares to the other isotopes. (e)</p> <p>^{13}N will have the same atomic mass as ^{13}C because the total number of protons and neutrons is the same.</p> <p>AND</p> <p>^{13}N is heavier than ^{12}C because it has one extra proton.</p> |
| Sufficiency for Q1 | $2 \times a = A$ | $2 \times m = M$ | $1 \times e = E$ |

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| TWO | <p>TWO Correct statements (2xa).</p> <p>Eg: Na: electron configuration 2.8.1 / 1 electron in outer shell.</p> <p>OR</p> <p>Na highly reactive.</p> <p>OR</p> <p>Na readily gives up (outer) electron.</p> <p>OR</p> <p>Na⁺ ion has an electron configuration 2.8 / has a full outer shell.</p> <p>OR</p> <p>Oil prevents the sodium coming in contact with air / reacting with moisture in the air.</p> <p>OR</p> <p>Sodium reacts with oxygen.</p> <p>OR</p> <p><i>Correct word equation</i> sodium + oxygen → sodium oxide</p> <p>OR</p> <p>Na₂O (can be sourced from symbol equation).</p> | <p>TWO Correct explanations (2xm).</p> <p>Eg: <i>Configuration and reactivity</i> Na has a loosely held outer electron and so is very reactive.</p> <p>OR <i>Reaction with oxygen</i> When sodium comes in contact with the air, it readily reacts with the oxygen to form sodium oxide / Na₂O.</p> <p>OR <i>Storage in oil linked to reactivity</i> Sodium is stored under oil to prevent it coming in contact with the air because it is so reactive.</p> <p>OR <i>Pure form and reactivity</i> Sodium is not used in its pure form due to its high reactivity. It will immediately form an oxide when placed in the air.</p> <p>AND equation (m)</p> <p><i>Correct word equation</i> sodium + oxygen → sodium oxide</p> <p>OR</p> <p><i>Unbalanced symbol equation</i> Na + O₂ → Na₂O</p> | <p>Discusses why sodium goes dull in air and why it is not used in its pure form. (2xe)</p> <p>Eg: Sodium is a Group one element / has an electron configuration of 2.8.1. This outer electron is easily lost to form the sodium ion Na⁺ with a stable electron configuration of 2.8.</p> <p>OR</p> <p>Sodium is not used in its pure form due to its high reactivity with oxygen leading to a reaction and formation of sodium oxide.</p> <p>OR</p> <p><i>Correctly balanced chemical equation.</i></p> <p>4Na + O₂ → 2Na₂O</p> |
| Sufficiency for Q2 | 2 × a = A | 3 × m = M | 2 × e = E |

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| THREE (a) | ONE correction made. (a) EITHER ZnO_2 changed to ZnO . OR H_2 removed. | TWO corrections made (m) ZnO_2 changed to ZnO AND H_2 removed. But equation NOT balanced. Eg: $\text{ZnO} + \text{H}_2\text{SO}_4 \rightarrow 2\text{H}_2\text{O} + \text{ZnSO}_4$ | Correctly balanced equation.(e) $\text{ZnO} + \text{H}_2\text{SO}_4 \rightarrow \text{H}_2\text{O} + \text{ZnSO}_4$ |
| (b) | ONE correct statement. (a) ZnO formula is wrong / charges don't balance. OR H_2 is not produced. OR The number / amount of atoms on each side is not balanced / is not the same. | Explains ONE area where the equation needed changing. (m) ZnO_2 changed to ZnO , as ZnO has a one to one ratio because Zn forms Zn^{2+} / ion and oxygen an O^{2-} / ion. OR H_2 was removed from the equation as hydrogen gas is not a product of an acid + base (metal oxide) reaction. OR Balanced equations show the same amount / number of atoms on each side so '2' is removed from $2\text{H}_2\text{O}$ as there are 2 H on the left. | Discusses TWO areas where the equation needed changing. (e) ZnO_2 changed to ZnO , as ZnO has a one to one ratio because Zn forms Zn^{2+} / ion and oxygen a O^{2-} / ion. OR H_2 was removed from the equation as hydrogen gas is not a product of an acid + base (metal oxide) reaction. OR Balanced equations show the same amount / number of atoms on each side so '2' is removed from $2\text{H}_2\text{O}$ as there are 2 H on the left. |
| Sufficiency for Q3 | $2 \times a = A$ | $2 \times m = M$ | $2 \times e = E$ |

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| FOUR | <p>TWO correct statements (2 × a)</p> <p>Eg: Neutralisation is when a base cancels an acid / products are neither acid or base</p> <p>OR</p> <p>Neutralisation is when the solution reaches pH of 7.</p> <p>OR</p> <p>NaOH / base increases the pH.</p> <p>OR</p> <p>NaOH / base neutralises or cancels out the acid.</p> <p>OR</p> <p>Use Universal Indicator / blue and red litmus to detect neutralisation.</p> <p>OR</p> <p>Universal Indicator / blue and red litmus paper will change colour.</p> <p>OR</p> <p>Acid + base → salt + water</p> <p>OR</p> <p><i>Correct word equation.</i> Sodium hydroxide + sulfuric acid → sodium sulfate + water</p> | <p>ONE correct simple explanation. (m)</p> <p>Eg: Neutralisation is when the products (salt and water) of the reaction form at pH 7.</p> <p>OR</p> <p>$[H^+] = [OH^-] / H^+ + OH^- \rightarrow H_2O$</p> <p>OR</p> <p>At the beginning the solution is red / orange due to the H_2SO_4 and U.I. At neutralisation the solution turns yellow-green / green.</p> <p>AND equation (m)</p> <p><i>Correct word equation.</i> Sodium hydroxide + sulfuric acid → sodium sulfate + water</p> <p>OR</p> <p><i>Unbalanced symbol equation.</i> $NaOH + H_2SO_4 \rightarrow Na_2SO_4 + H_2O$</p> | <p>Correctly balanced chemical equation. (e)</p> <p>$2NaOH + H_2SO_4 \rightarrow Na_2SO_4 + 2H_2O$</p> <p>AND</p> <p>Correct thorough explanation of neutralisation AND how you use an indicator to observe neutralisation. (2 × e)</p> <p>Neutralisation is when a salt and water are produced because the amount of acid = the amount of base. The NaOH increases the pH towards 7 by cancelling out the acid.</p> <p>OR</p> <p>Neutralisation is when the products of the reaction are pH 7 and (as the amount of H_3O^+ = the amount of OH^-) the amount of acid equals the amount of base (when $pH = 7 = [H_3O^+][OH^-]$).</p> <p>AND</p> <p>At the beginning the solution is red due to the H_2SO_4. At neutralisation it is yellow-green / green due to the Na_2SO_4 and H_2O (or no H_2SO_4) present.</p> <p>OR</p> <p>Explains clearly how they would ascertain neutralisation using an appropriate indicator, eg. Add a few drops of Universal Indicator solution. Monitor colour changes as reaction proceeds: red in acid → yellow-green / green when neutral.</p> |
| Sufficiency for Q4 | $2 \times a = A$ | $2 \times m = M$ | $3 \times e = E$ |

Judgement Statement

| Achievement | Achievement with Merit | Achievement with Excellence |
|--------------|------------------------|-----------------------------|
| 2 A or above | 1 A 2 M | 1 M 2 E |

Lower case **a**, **m**, **e** may be used throughout the paper to indicate contributing evidence for overall grades for questions.

Only the circled upper case **A**, **M** and **E** grades shown at the end of each full question are used to make the final judgement.